

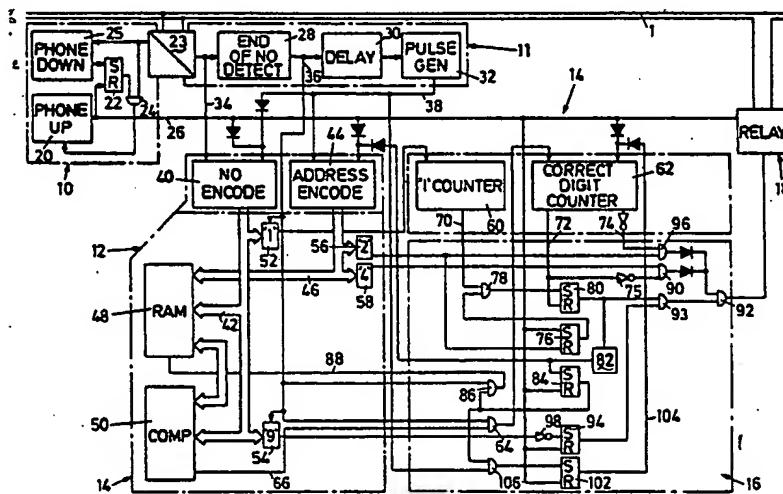


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(54) Title: TELEPHONE LINE ACCESS CONTROL



## (57) Abstract

Telephone line access control (6) for preventing unauthorised outgoing calls on a telephone line (1). The control (6) includes means (10, 11) for monitoring dialling signals on the line, means (12) for encoding the monitored signals, means (14) for comparing the encoded signals with a memorized authorisation code, a, bistable access mode control means (80) switchable between a first de-activated state permitting outgoing calls, and a second activated state preventing outgoing calls, and control circuitry (16) effective when the access control means is activated for temporarily interrupting the line connection when the encoded signals do not match the authorisation code, and for both temporarily interrupting the line connection and de-activating the access mode control means when the encoded signals match the authorisation code.

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TITLE:

Telephone Line Access Control

DESCRIPTION:

Field of Invention

5 The invention relates to telephone line access control, including devices and systems, for use in restricting the use of telephones to authorised persons or to restrict the kind of use which may be made of the telephones.

10 Background of the Invention

In this specification and claims certain terms are for convenience used in a generic sense even though there may be more specific meanings.

15 The term 'line' refers usually to the actual telephone line but should be construed for the purpose of this Application as including any channel accessible to a user for transmitting signals.

20 The line is part of a network which includes telephones and exchange and covers part of the line internally of and externally of a building.

'Seizing' and 'releasing' of a line normally results from 25 the actual lifting of a handset out of or into a cradle, but these terms should also be construed to cover any manner in which a line can be influenced to prepare it for signal transmission through the network or to end such preparation. 'Seizing' and 'releasing' can hence also be 30 effected electronically, for example through MODEMs.

'Dialling' normally refers to the actual turning of a dial or the keying in on a push button pad following line seizure. The term is to be construed as covering any 35 manner of inputting numerical data into the

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telecommunication network, whether it be a dialling code or any other numerical input, whether pulse or frequency encoded. The term 'dialling' covers voice or other remote operation and extends to numerical codes not part of the 5 usual dialling codes.

In modern telecommunications practice telephones may be equipped for direct dialling out without using an operator or internal exchange. Thus there is no monitoring of 10 outgoing calls and there is risk of abuse.

Telephone line access control systems are known from US 4,346,264, GB 2,123,254 and GB 2,133,250. These known systems may be difficult to install, require telephone 15 modification or involve use limitations.

US 4,346,264 (Sharrit) restricts pre-selected and pre-programmed prohibited numbers. There is no general restriction on all outgoing calls. Prohibited numbers can 20 be called by waiting a set period and then dialling an access code. During this time a load is turned ON so as to prevent transmission of the access code to the network. After dialling of the access code the load is removed, the line can be seized and a prohibited call made with the 25 arrangement for barring the transmission of prohibited numbers being overridden. The access code cannot be changed readily and only one prohibited call can be made after each access code input.

30 GB 2,123,254 (Answercall) shows an arrangement for selectively barring outgoing calls in which a key operated switch is used to alter the barring system. The system involves a microprocessor which holds telephone numbers, the use of which may or may not be restricted. The 35 restrictions can only be modified or overcome by operation

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of the key operated switch which is associated with a telephone hand set and additional to the conventional keypad.

- 5 GB 2,133,250 (Oki Electric Industry) has a predetermined unlocking code which can overcome outgoing call restrictions which codes must be inputted when the telephone is down and the line has not been seized. This provides 20 seconds for the dialling of a prohibited number
- 10 15 when the hand set is lifted. The arrangement does not permit code changes and is necessarily used in conjunction with a particular telephone set. The system is generally in a restrictive mode.
- 15 It is amongst the objects of the invention to provide a telephone line access control system which can be installed conveniently and used selectively.

Summary of the Invention

- 20 According to the invention there is provided a telephone line access control for preventing unauthorised outgoing calls on that line, comprising means for monitoring dialled signals on that line, means for encoding the monitored signals, means for comparing the encoded signals with a
- 25 memorized authorisation code, a bistable access mode control means switchable between a first de-activated state permitting outgoing calls and a second activated state preventing at least some types of outgoing calls, and control circuitry effective when the access control means
- 30 is activated for effecting temporary line release when the encoded signals do not match the authorisation code, and for both effecting temporary line release and de-activating the access mode control means when the encoded signals match the authorisation code. When there is no match, the
- 35 temporary line release will cause the call to be

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interrupted. Any long number dialled without authorisation code will fail in this mode. When there is a match, the temporary line release will cause the authorisation code dialled to be separated from the subsequent proper number so that the exchange in the network will make the proper connection. De-activation of the access mode control means ensures that the dialling of the number proper is not interrupted and can proceed in an unrestricted manner. The authorisation code is the equivalent to a de-activation code which removes telephone line access restrictions.

The control operates by monitoring the line and need not be associated with a particular telephone set, although it is possible for the control to be part of a set. The access control cannot be overcome by switching telephone sets if a common access control is used on the exchange line to which a number of sets in an office are connected.

The control operates in all instances by temporarily releasing the line so leaving the line available for incoming calls even if access control is activated and permitting instruction codes for the control apparatus and usual dialling codes to be differentiated.

Preferably means are provided for activating the access control means in response to a dialled activation code, although it is also possible to so arrange the control that the activation signal is obtainable upon termination of an outgoing call so as to activate the access mode control when the phone line is released. Activation has once more the effect of restricting outgoing calls. By using a separate activation code, activation can be effected when desired at certain times or after a number of calls have been made.

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Most suitably the activation code consists of one or more digits and means are provided allotting a corresponding number of dialled digit signals after line seizure to thereby permit the activation code to be dialled after line  
5 seizure and before a sufficient number of digits has been reached which could permit a call to be established. Thus a short number can be used to activate, yet the occurrence of the number or its constituent digits in a dialled code cannot trigger activation unintentionally.

10

Advantageously the authorisation code memorised is changeable on command. Preferably the change is accomplished as follows. First the access control means is deactivated by dialling the authorisation code (this step  
15 may be omitted if the access control means is already deactivated). Then the activation code is dialled. Termination of the dialling sequence and replacing the telephone receiver at this stage causes reactivation of the access control means to prevent subsequent calls, without  
20 changing the authorisation code. However any further digits dialled after the activation code become the new authorisation code and are memorised as such. It is to be noted that a new authorisation code can be inserted only if the access control means has already been deactivated by  
25 someone with knowledge of the old authorisation code.

Preferably means are provided to ensure that continued dialling for inserting the new authorisation code leaves the access mode control means in the activated state and a  
30 means is provided for preventing the new authorisation code inputted from acting to de-activate the access mode control means. Thus after entry of the new authorisation code, a telephone can be put down with further calls only possible by dialling of the new authorisation code.

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Different features of the invention are explained in more detail by reference to a description of the drawings which follow.

5 **DRAWINGS:**

Figure 1 shows schematically the overall lay-out of a telephone system including an access control system of the invention;

10 Figure 2 shows a block diagram of the circuit of the control system of Figure 1;

Figure 3 shows a circuit diagram of the circuit of Figure 2; and

Figure 4 shows part of the diagram of Figure 3 but modified for additional user facilities.

15

Description with reference to drawings/overall arrangement

With reference to Figure 1, the telephone 2 is of conventional push-button design. At the junction box 4 a circuit 6 is provided for 'listening in' on an exchange or 20 data line 1 to which pulses are provided as dialled outputs from the telephone. The circuit 6 may be of discrete components and externally powered. However preferably the circuit is largely of an integrated design using one or more integrated circuits as will be explained with a power 25 consumption sufficiently low to use and operate on the exchange line power supplied to the telephone 2.

The circuit 6 operates a switch 8 for triggering line release. The switch 8 can be used for temporarily 30 influencing the data-line to cause the network to regard any unauthorised call as terminated, causing the line to be effectively released and forcing the unauthorised user to re-dial or stop trying. It should be noted that the circuit does not itself terminate the call, although in 35 this case it acts by briefly disconnecting the line. Any

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- exchange in the network, of which the line forms part, reacts to the line disconnection and terminates the call with the circuit merely triggering the actual line release. The system does not interrupt incoming calls at all and  
5 need not be physically associated with a particular telephone. Thus the system does not act to disable an individual phone set totally or to block the line which it monitors. The circuit 6 and switch 8 (which may be of relay or solid state type) can be mounted in the socket at  
10 a junction box. If any attempt is made to physically remove the circuit 6, a considerable amount of work is required both in the removal and in joining the phone line, thus deterring abuse.
- 15 The circuit 6 monitors the line 1 which can serve one or more connected phone sets.

#### Main Circuit Functions

- With reference to Figure 2, the circuit 6 has a series of  
20 components 21 monitoring the exchange line with the dual function of detecting whether the telephone has been picked up or put down and whether the line has hence been seized or released, and for processing input pulses dialled out on the line 1 when the line has been seized. Outputs from  
25 components 21 are supplied to encoding circuitry 12 to distinguish appropriate numbers which have been dialled out. The numbers are compared in comparison circuit 14 which, dependant on the nature of the numbers, operates logic circuitry 16 at suitable intervals. When  
30 appropriate, the logic circuitry enables various circuit components and operates a relay 18 to cause the switch 8 to trigger temporary telephone line release.

In this particular embodiment the circuit has been designed  
35 to provide certain functions and the main principles of the

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design are next outlined before describing the circuit 6 in detail.

- The circuit 6 can be set to permit unrestricted access by dialling in an authorisation code in which case access mode control is said to be 'de-activated'. The circuit 6 can also be set to restrict access by dialling in an activation code in which mode the circuit is said to be activated. In any event whether the circuit is activated or de-activated, the line is normally in a condition permitting outgoing calls (and so the passing of appropriate activation or authorisation codes). The circuit 6 only causes the line to be temporarily released to prevent the completion of an attempted outgoing call when access is restricted or to prevent any dialled activation or authorisation code, intended to influence the circuit 6, from being regarded by a connected telephone exchange as part of a normal dialling code. To minimise or eliminate any restriction on outgoing calls when the access mode control is 'de-activated', the activation code is selected to be a short sequence of numbers which does not normally occur at the start of a dialling code, such as the UK code '1,1'. Thus effectively all numbers can be dialled without activating access control.
- The circuit 6 stores the authorisation code in a random access memory. The circuit 6 hence includes components for enabling access to RAM to permit a change of code. In this particular case, the activation code can be used when the circuit is in the de-activated mode to initiate a change in the authorisation code. Thus the code can only be changed by a user who has used the previously correct authorisation code, preventing unauthorised code change.

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The circuit 6 is also adapted to permit emergency 999 calls at all times.

5 The circuit is initialised shortly after the phone has been picked up and the line has been released so that it is ineffective when the phone is put down.

Phone Use Detection

10 With reference to Figure 3, the circuit part 21 for monitoring line signals includes a line pulse detector and modifier 23. A line release or phone down detector 25 provides an output pulse to set a latch 22 high when the phone line is released when the phone line changes from 50 volt R.M.S. (Root Mean Square) pulse transmitting mode to a  
15 10 V d.c. R.M.S. condition. When the phone line is seized, an AND gate 24 enabled by the latch 22 passes a signal to a line seizure or phone-up detector 20, again from the change in line condition. Following phone pick-up, a single prolonged reset pulse is passed by the phone up detector 20  
20 along to various devices, the pulse being of a sufficient length to avoid any line noise resulting from seizing of the line. At the same time, the latch 22 is reset low until the phone line is next released. The circuit 6 can in this way be operated so that it is ready to process any  
25 monitored dialled signals from a properly initialised condition and can be made inoperative when the phone line has been released.

Pulse Processing

30 The circuit part 21 also shapes any data pulses and supplies an interval detector 28 which detects the end of a train of pulses (normally sent at a frequency of 10 per second) and hence, a pulse delay device 30 and a pulse generator 32. The pulse processing circuitry provides an  
35 output 34 of shaped pulses, a non-delayed end of dialled

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signal output 36, indicating the end of a digit, and an output 38 delayed slightly until after the end of a dialled digit. Thus clean pulses can be presented for encoding and delayed and non-delayed clockpulses can be obtained to 5 permit the circuit to encode, read, compare and act on each successive dialled input signal.

Encoding

The encoding circuit 12 includes a number encoder 40 10 receiving the output 34 and outputting to a data bus 42 a binary coded number corresponding to the number of pulses in the pulse train of a line signal passed along line 1. The encoder 40 counts the pulses and outputs any binary code from representing digits from 0 to 9 to the bus. 15 There is also provided an address encoder 44 which receives the output 38 following each dialled digit and outputs to an address bus 46 a binary coded number corresponding to the number of the dialled digits.

20 Comparing Circuitry

The comparing circuitry 14 includes a random access memory 48. A comparator 50 receives the digit and address of the successive digits of an authorisation code stored in the memory 48 and also the digits and address of the successive 25 digits dialled and passed along the line 1 to compare them. The encoding circuit 12 includes a detector 52 for detecting if the dialled digit is 1, a detector 54 for detecting if the dialled digit is 9, a detector 56 to detect when two digits have been inputted and a detector 58 30 to detect when four digits have been inputted. The circuit 14 further includes a '1' counter 60 connected to the '1' detector 52, and a correct digit counter 62 connected through an enabling AND gate 64 with a comparator output 66. Thus each encoded dialled signal is processed to 35 increment, if appropriate, the counters 60 and 62. When

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the signal corresponds to the part of the authorisation code with the same address then a correct digit pulse is provided by the comparator output 66 to increment the counter 62. The encoders 40, 44 and the counters 60 and 62 5 maybe of similar structure but are connected differently on the input and output side to perform their respective functions.

Logic Circuitry

10 The logic circuitry 16 contains a number of low power consumption latches and gates which process counter outputs 70, 72 and 74 and the condition of the detectors 52, 54, 56 and 58 so as to selectively trigger the relay 18 which actuates the switch 8 which can cause the temporary release 15 of the telephone line 1.

Operation

Initialisation

The user picks up the telephone causing the line 1 to be 20 seized and the circuit 6 to be initialised after a short delay to blank out noise from picking up of the phone, through the initialisation line 26.

Activation

25 A latch 80 of the logic circuit 16 serves to provide a bistable access mode control latch. Assuming that the circuit was last de-activated by a sequence of operations explained later, the latch 80 is in a reset condition and has a low output. In this mode AND gates 93 and 92 and 30 relay 18 are naturally disabled. The initialisation has set a latch 76 for recording the occurrence of activation so that its output is high.

The user then dials out '1' and '1'.

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The '1' counter 60 is loaded by the '1' detector 52 clocked by the 'dialled signal completed' output 36. After the second '1', the output from counter 60 goes high. An AND gate 78 is enabled by the latch 76 so that the access mode control latch 80 is reset, its output going high. Thus latch 76 and gate 78 serve as means for activating the bistable access mode control latch 80.

The two digit detector 56 goes high shortly afterwards as the address bus is clocked by the delayed 'dialled signal completed' line 38, causing the latch 76 to be reset, its output to go low and disabling the AND gate 78. Thus the latch 80 can only be set by two successive 1's without any prior digit. A dialling code containing two 1's but not at the start of a number can not activate the access mode control. A repeated dialling of '1,1' will not have the same effect as the AND gate 78 is disabled. The circuit will only process another '1,1' command after another initialisation stage during which the latch 76 is reset.

The latch 76 thus records that after initialisation, the circuit 6 was changed from a de-activated to an activated mode. The two digit detector 56 and the latch 76 thus serve as means to allot two digit positions to the activation code upon line seizure.

25

If the operator were to attempt to input 101 for example, after two digits the output 70 would still be low preventing enabling of the random access memory 48. By the time output 70 goes high, after the third digit, the two digit counter 56 has reset the latch 76 disabling the AND gate 78 and preventing opening of the memory 48. Thus dialling of codes incorporating '1's interspersed with other members will not trigger activation.

35 The setting of the latch 80 by the 1,1 activation code also

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has the effect of triggering a pulse generator 82 which in turn sets a RAM access control latch 84 and clears the address encoder 44.

- 5 After activation the user can wait until he hears the 'number unobtainable' tone to ensure that activation is completed. The telephone network will generate such a 'number unobtainable' tone in response to the dialling of 1',1' in this manner because there is no such number in the  
10 United Kingdom.

The user then puts the telephone down, releasing the line 1 and ensuring that the next time the circuit monitors any dialled signals, the circuit 16 has once more been  
15 initialised following line seizure, resetting the latch 84 in the process.

Inserting an Authorisation Code

- This is performed similar to activation but after  
20 activation by '1,1', the phone is not put down leaving the output of the latch 84 set high. The 'number unobtainable' tone is awaited as before. The high output of the latch 84 enables an AND gate 86. The next four digits dialled will be entered along line 1 into the RAM memory 48. The user  
25 then puts the phone down. The latch 84 next is reset but the latch 80 is still in the set condition with access control activated. Whilst inputting these four numbers the 'number unobtainable' tone will be maintained, preventing any call being established through the exchange.

30

From then on, outgoing calls are not possible unless the circuit 6 is de-activated as will be explained. The operation described serves to both insert the initial authorisation code and to change the authorisation code  
35 with the four dialled digits superseding the four digits

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previously stored in the memory 48.

If, before dialling '1,1' the latch 80 had been in the only other condition possible that is to say set with its output 5 high and not having been de-activated, then there will be no change from low to high on the output of latch 80 triggering the pulse generator 82 and no enabling of the RAM memory 48. If '1' and '1' is dialled in this condition, the latch 76 will after initialisation, enable 10 AND gate 78 but the generator 82 will not set the latch 84 and any number dialled will not be put into RAM 48.

The output from the RAM access control latch 80 also enables a further AND gate 102 (reset upon initialisation) 15 whose output goes high to clear the correct digit counter 62 following setting of the latch 84 prior to authorisation code insertion. This prevents the latch 80 from being reset by the high outputs generated by the comparator 50 in coincidental fashion during this operation. If the latch 20 84 does not permit RAM access, the latch 102 retains its low output. The latch 102 serves as the means for preventing the new authorisation code inputted from acting to de-activate the access mode control means. Calls made subsequent to the insertion of a new authorisation code 25 will thus be restricted.

#### Phone-Down

When the phone is put down and the line is released, the latch 22 is operated by the phone-down detector to set the 30 initialisation line 26 high so as to reset all counters and encoders and to set and reset all latches as appropriate to prevent energisation of the relay 18. Thus incoming calls can pass to the telephone through line 1 without interruption. If a new authorisation code was inserted 35 last, putting down of the phone, leaves the latch 80 in the

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set condition, resetting having been prevented by locking off of the correct digit counter 62 following setting of the latch 102. Thus the circuit 6 is activated whether by '1,1' command alone or by that command followed by a  
5 freshly inserted authorisation code.

Unauthorised Dialling Out

When the circuit is activated and another user next lifts the telephone, then on dialling the output 66 will go high  
10 when a number and address of the dialled number correspond to the number and address of the authorisation code in the memory 48. When the user starts dialling with any one of the first four digits not identical to the authorisation code, then after four digits, output 72 of correct digit  
15 counter 62 will still be high. An invert gate 75 thus enables an AND gate 90, the counter 62 not having received four successive pulses through output 66. When the four digit detector 58 goes high with a delay, the AND gate 90 enables the AND gate 92.

20

The latch 80 has a high output in the activated condition and (as will be explained) output from a latch 94 is also high, the AND gate 92 causes the relay 18 to be energised through AND gate 93. The line 1 is interrupted, causing  
25 line release, breaking the dialling sequence and forcing the user to give up or try again. Thus, unless the correct authorisation code is used, the circuit 6 will continue to be activated and prevent outgoing calls along line 1. Upon line release, the phone-down detector reacts to the  
30 temporary change to re-initialise the circuit.

It is to be noted that the output of the latch 84 is low, disabling the memory 48.

35 Dialling codes containing three numbers could pass along

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line 1 before the relay 18 disconnects the line by virtue of the 4 digit detector 58 going high. To prevent this the counter 62 has an inverted output 74 which goes high when the first two digits of the authorisation code in conjunction with the two digit detector 56 and AND gate 96. Thus the line interruption may occur after the first two digits or after the four digits if the first two digits are correct and an error is contained in the last two digits. However the circuit 6 remains activated even if the first two digits have been found correct.

#### De-Activation

If the user dials the correct four digit authorisation code, when the circuit 6 is activated, then after the fourth correct digit the output 72 goes low, resetting the output of the access mode control latch 80 low. The counter 62 is timed by the non-delayed end of dialled signal ouptut 36 through an AND gate 64. The AND gates 90 and 96 are enabled shortly afterwards by the 2 and 4 digit detectors 56 and 58. Thus on complefion of the fourth correct digit, the latch 80 is reset immediately but the outputs from AND gates 90 and 96 only go high with a short delay. Thus the relay 18 triggers release of the telephone line by the network exchange so as to end a dialling sequence prematurely as before but with the difference this time that the latch 80 is reset. Thus any dialling activity, will from now on be without interruption permitting unrestricted use of the telephone. The disconnection at the end of the de-activation by insertion of the correct authorisation code, ensures that the exchange does not treat the authorisation code as part of the dialled code for making a telephone call.

#### Re-Activation

To re-establish access control, the user again keys in the

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activation code '1,1' and puts the phone down. The output of the access mode control latch 80 is once more high. Use is henceforth only permitted after dialling of the authorisation code.

5

Emergency Dialling

To permit dialling in emergencies when the circuit 6 is activated, emergency codes are recognised. The UK emergency code is '9','9','9' and so a simple arrangement 10 can be used to bypass the access control and to avoid disconnection. Whenever a 9 is dialled, the 9-detector 54 will output through inverter 98 to keep the output of the AND gate 93 low, avoiding setting of a latch 94 (reset during initialisation) and preventing energisation of the 15 relay 18. As soon as a non-9 number is dialled, the emergency code by-pass latch 94 will be set, providing a high output, enabling the AND gate 93 to pass any signals for energising the relay 18 generated in other parts of the circuit 6. Thus a 999 emergency call can be made without 20 interruption or release of the phone line. For any other sequence of numbers, the access control system is operative.

Modifications

25 Whilst the latch 80 is shown set high by the activation code '1,1' in modified designs the latch 80 may be set high by another activation code or whenever the phone is put down or an authorised call completed. It is also possible to provide the option of removing access restrictions for 30 one call at a time to a specified address by a special command.

The system can be refined to restrict only calls starting with 0 or 01 or other trunk or international dialling 35 codes. Calls not commencing with such digits could be made

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in an unrestricted way, but whenever such a dialling code is used, the system would disconnect the call unless the latch 80 was reset by the appropriate code.

- 5 It is also possible to inject a tone to indicate that the line is a restricted access line so as to prevent a reverse charge call being made.

Once the telephone is picked up in reply to a call, the 10 line noise interpreted by the encoding circuit could be erroneously identified as a pulse train which could accidentally trigger the relay 18 causing a brief interruption of the call. This would not result in a permanent disconnection. Suitable circuitry can be used if 15 required to prevent accidental triggering of temporary disconnection.

Either one set or a number of sets may be connected to a single telephone line equipped with a single control, or 20 separate access controls may be associated with each extension to provide individual access control.

#### Advantages

The system restricts access for any form of telephone 25 including push button telephones. Outgoing calls only are subject to the restriction. Selected emergency numbers can be made accessible at all times. All the vital operations of activating and de-activating and changing of memorised authorisation codes can be performed using standard 30 telephone sets, purely by monitoring line signals.

The system can be adapted for tone and frequency dialling systems. The system does not require physical linkage with the telephone set. Low power consumptions possibly with 35 integrated circuits may permit the system to operate.

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without external power sources. The system cannot be by-passed by switching telephone sets from socket to socket if the circuit is connected and mounted in the junction box bringing the exchange line into a building. The system 5 provides a high degree of access control at a relatively low level of extra effort from the user. Because the line can be left without access control (after de-activation), efficient telephone use is possible as re-activation and authorisation can be limited to when the authorised user 10 thinks it is appropriate. It is not necessary to perform the authorisation routine at every call.

The invention can be adapted for tone dialling by appropriate modification of the encoding circuitry. In an 15 integrated circuit form preferably separate integrated chips are provided for encoding on the one hand (whatever tone or pulse frequency dialling methods are used) and the comparator and logic circuits operated by the encoded inputs on the other hand (which may be of a common design).

20 The invention can also be modified - suitably by the provision of a modified comparator and logic integrated circuit chip - to provide additional user facilities. For example, a circuit can be provided with a memory for 25 permitted numbers which may be used even when memory access control is activated. Such numbers may be those used for checking credit cards. It is also possible to postpone temporary line release when the encoded signals do not match the authorisation code to permit the use of the 30 telephone in restricted circumstances before the call is interrupted by temporary line release. For example the unauthorised user could be allowed a short duration call before line release is triggered. Alternatively the exchange-generated charge pulses could be counted, and an 35 unauthorized user may be permitted to make calls up to a

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predetermined charge limit. Either the count of charge pulses could be reset to zero each call or, preferably, the count can be cumulative so that after it reaches the predetermined limit the call in hand is terminated and all 5 subsequent calls prevented except by the authorised user. In such a modification, means would be provided for setting or re-setting the predetermined charge limit and charge count.

- 10 Figure 4 illustrates a possible modification to the circuit of Figure 3 for such selective dialling restriction with the access control active. A circuit 120 receives a first input from AND gate 92 to record the absence or presence of activation. Lines 122 input charge pulses transmitted over 15 the line 1 from the exchange and trigger detector and controller 124 establishes when permitted telephone charge levels are exceeded. As soon as gate 126 has received an input from AND gate 92 and the controller 124 the relay 18 is operated for temporary line release. The controller 124 20 can be arranged to be programmable in a manner analogous to RAM 48 responsible for authorisation code retention. For example the user must first input the authorisation code and then dial an access code for the memory of the controller 124 which is again not a dialling code such as 25 '1,3'. The controller memory can then be programmed to permit a set charge level by inputting the appropriate numerical limit and then be activated. Activation could be effected by a '1,1' instruction. However preferably the same code as the access code is used to enable that 30 particular restriction. Other time or total cumulative charge restrictions could be programmed using other two-digit numbers.

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CLAIMS:

1. A telephone line access control for preventing unauthorised outgoing calls on that line, comprising means for monitoring dialled signals on the line, means for encoding the monitored signals, means for comparing the encoded signals with a memorized authorisation code, a bistable access mode control means switchable between first de-activated state permitting outgoing calls, and a second activated state preventing at least some types of outgoing calls, and control circuitry effective when the access control means is activated for effecting temporary line release when the encoded signals do not match the authorisation code, and for both effecting temporary line release and de-activating the access mode control means when the encoded signals match the authorisation code.
2. A control according to claim 1 in which means are provided for activating the access control means in response to a dialled activation code.
3. A control according to claim 2 in which the activation code consists of one or more digits and means are provided allotting a corresponding number of dialled digit signals after line seizure to thereby permit the activation code to be dialled after line seizure and before a sufficient number of digits has been reached which could permit a call to be established.
4. A control according to claim 2 or claim 3 in which the authorisation code memorised is changeable upon command.
5. A control according to claim 4 in which the completion of a dialled activation code and a switching of the access mode control means to the activated state enables access to a changeable memory, the arrangement being such that line

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release after activation disables memory access and continued dialling causes the later dialled digits to be memorised as the new authorisation code.

5 6. A control according to claim 5 in which means are provided to ensure that continued dialling for inserting the new authorisation code leaves the access mode control means in the activated state and a means is provided for preventing the new authorisation code inputted from acting  
10 to de-activate the access mode control means.

7. A control according to any of the preceding claims in which means are provided for supplying power from the line to operate the control.  
15

8. A control according to any of the preceding claims, adapted for securing at a junction box or socket.

9. A control according to any of the preceding claims in  
20 which the dialling signal monitoring means includes a means for analysing pulse trains on the lines and the intervals between successive pulse trains to distinguish successive dialled digits.

25 10. A control according to claim 9 in which the analysing means is adapted to count the number of pulses in a train to distinguish the dialled signals.

11. A control according to claim 10 in which the analysing means is adapted to detect the pulse frequency to distinguish the inputs.  
30

12. A control according to any of claims 9 to 11 in which the dialled signal monitoring means further includes a  
35 means for detecting whether the phone is up or down and

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such means are arranged to ensure the line permits incoming calls when the line is released.

13. A control according to claim 12 in which the up or  
5 down detecting means provides an initialisation signal to ready the control for operation when the line is seized.

14. A control according to claim 13 in which the initialisation signal is issued with a delay.

10

15. A control according to any of the preceding claims in which the encoding means are adapted to encode the number and address of a plurality of successive signals and the comparing means is arranged to issue a correct digit signal  
15 for each of the successive signals if it corresponds to the number and address of successive digits of the authorisation code.

16. A control according to claim 15 in which the  
20 comparing means includes counting means for counting the number of successive correct digits for providing an input to de-activate the access mode control means when the correct number of digits have been dialled in the correct number of successive addresses.

25

17. A control according to claim 15 or claim 16 in which the counting means is arranged to provide an output for temporarily disconnecting the line if incorrect numbers have been dialled at an intermediate stage to prevent  
30 unauthorised dialling of short dialling codes.

18. A control according to claim 1 in which the activation signal is obtainable upon termination of an outgoing call so as to activate the access mode control  
35 when the phone line is released.

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19. A control according to any of the preceding claims includes a means for permitting dialling out of selected telephone numbers even when the access control means is activated.

5

20. A control according to claim 19 in which the selected telephone numbers include one or more emergency dialling numbers.

10 21. A control according to claim 19 or claim 20 in which the selected telephone numbers includes all numbers not commencing with international or long-distance prefix numbers.

15 22. A control according to any of the preceding claims having restricted preprogrammed line access when the access mode control mean is in an activated state with temporary line release only effected when the access restrictions are transgressed.

20

23. An integrated circuit for a telephone line access control which circuit has means for comparing encoded signals with a memorized authorisation code, a bistable access mode control means switchable between first de-activated state permitting outgoing calls, and a second activated state preventing at least some types of outgoing calls, and control circuitry effective when the access control means is activated for effecting temporary line release when the encoded signals do not match the authorisation code, and for both effecting temporary line release and de-activating the access mode control means when the encoded signals match the authorisation code.

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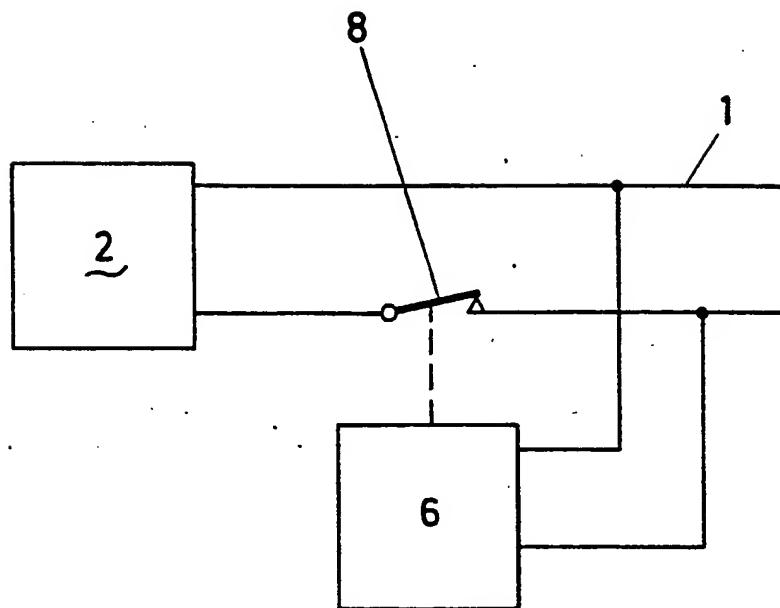


FIG. 1

**SUBSTITUTE SHEET**

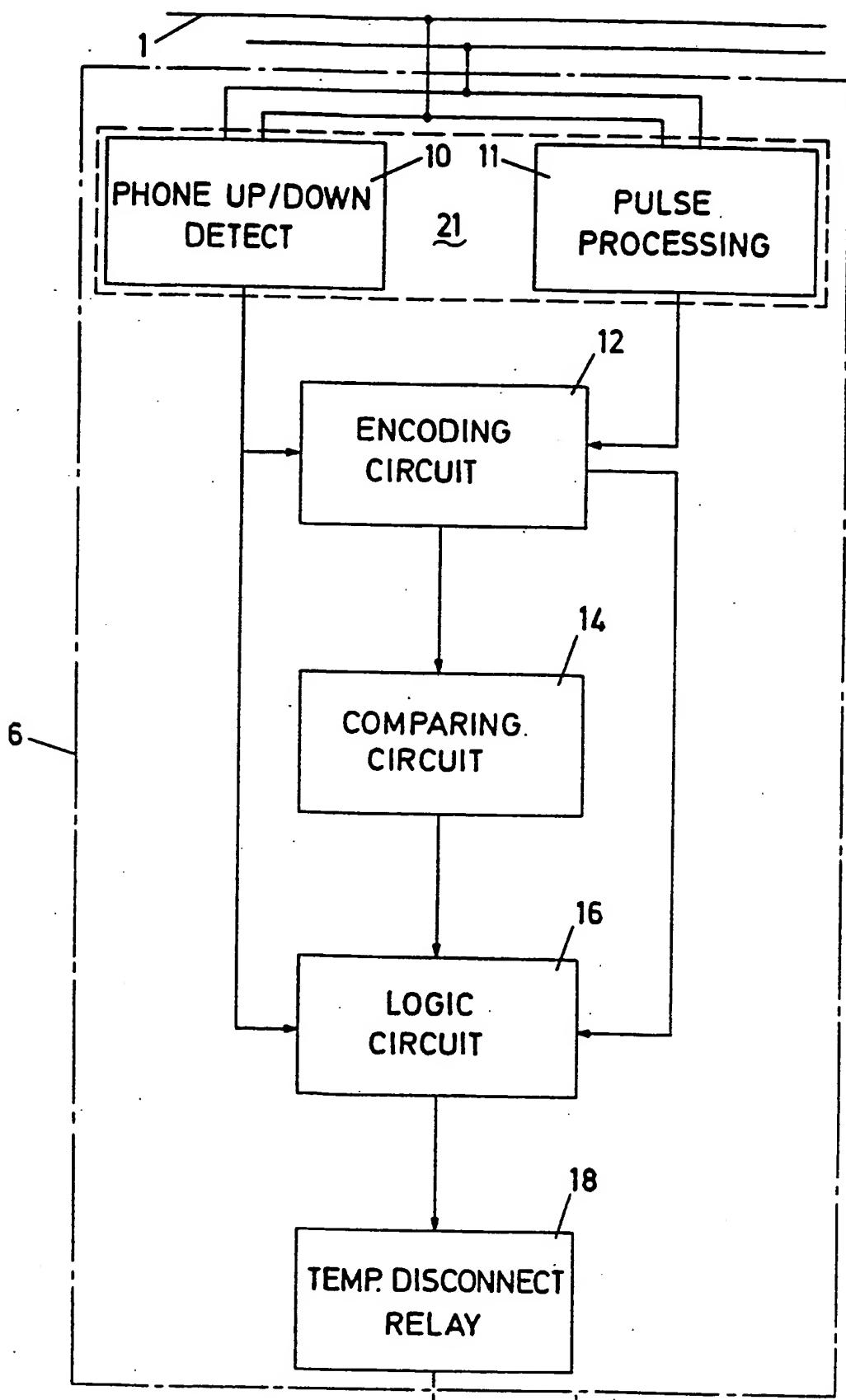


FIG. 2

SUBSTITUTE SHEET

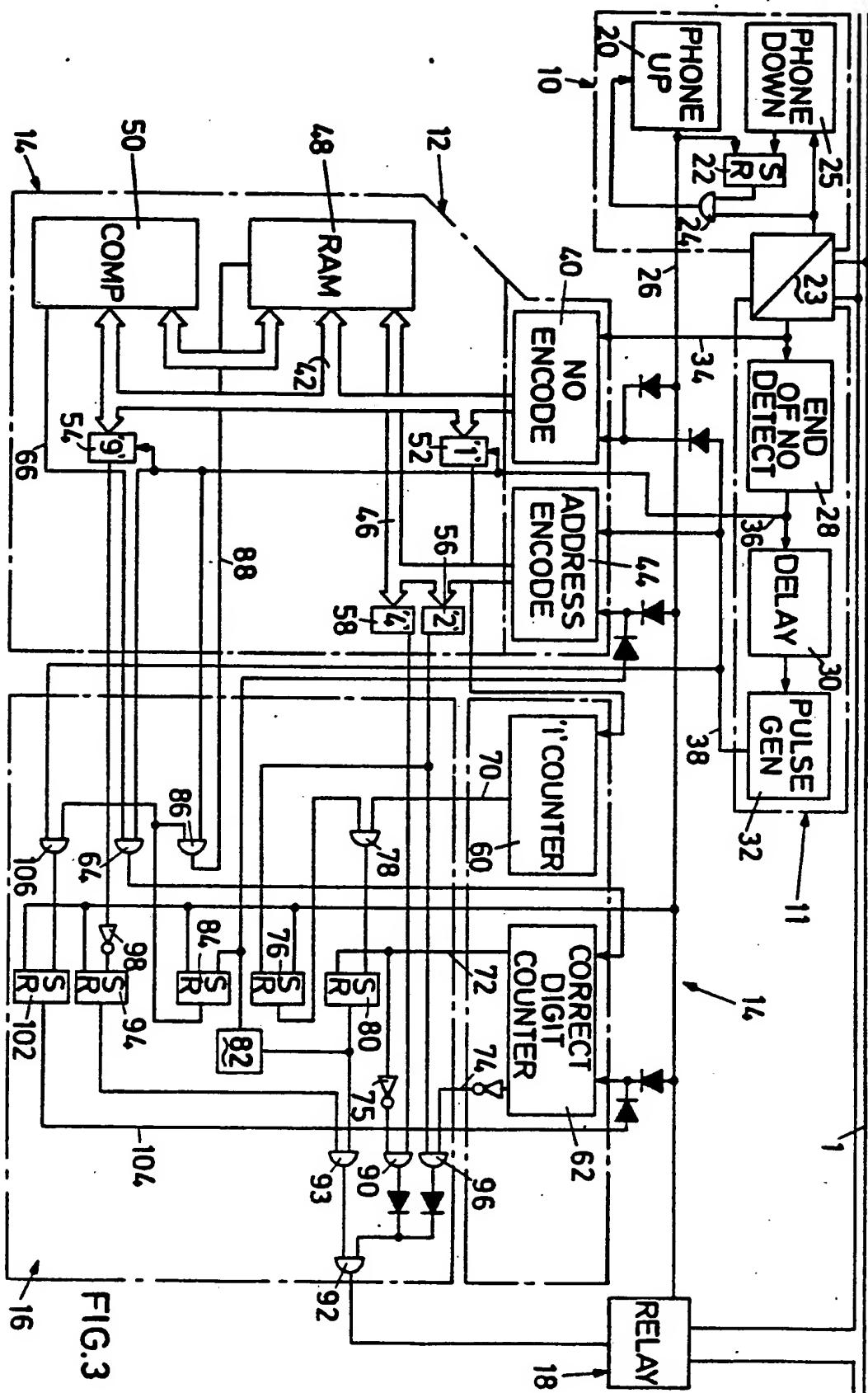


FIG.3

SUBSTITUTE SHEET

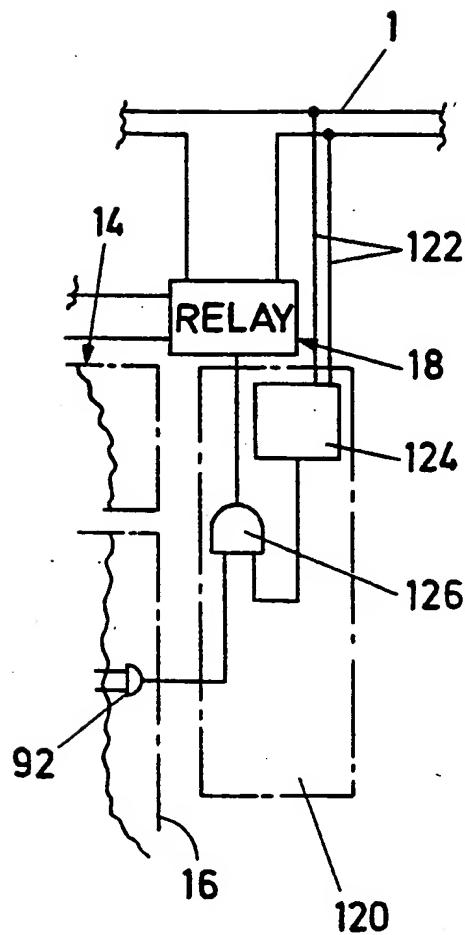


FIG. 4

**SUBSTITUTE SHEET**

# INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 86/00368

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) <sup>4</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

<sup>4</sup>  
IPC : H 04 M 1/66

## II. FIELDS SEARCHED

Minimum Documentation Searched ?

Classification System	Classification Symbols
IPC <sup>4</sup>	H 04 M

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched \*

## III. DOCUMENTS CONSIDERED TO BE RELEVANT\*

Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB, A, 1579873 (MURRAY) 26 November 1980, see page 2, line 11 - page 4, line 47; figures	1-4
A	--	7, 9, 10, 15, 16, 23
A	GB, A, 2086187 (STANDARD TELEPHONES & CABLES) 6 May 1982, see page 1, line 30 - page 2, line 51; figures	1-4, 9-10
A	DE, A, 3312625 (NEUMANN ELEKTRONIK) 18 October 1984, see page 4, lines 24-26	8
A	EP, A, 0126496 (ITALTEL) 28 November 1984, see page 3, line 33 - page 16, line 22, figures	1-4
	--	

\* Special categories of cited documents: <sup>10</sup>

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search

2nd October 1986

Date of Mailing of this International Search Report

21 NOV 1986

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

M. VAN MOL

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB.86/00368 (SA 13758)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 11/11/86

The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 1579873	26/11/80	None	
GB-A- 2086187	06/05/82	None	
DE-A- 3312625	18/10/84	None	
EP-A- 0126496	28/11/84	None	